FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Resource Management, Bureau of Watershed Management

SOUTHWEST DISTRICT • TAMPA BAY TRIBUTARIES BASIN

TMDL Report

Total Coliform TMDL for Cypress Creek (WBID 1402)

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September 2004

Acknowledgments

This study could not have been accomplished without significant contributions from staff in the Florida Department of Environmental Protection's Watershed Assessment Section. Douglas Gilbert provided the statistical data, David Tyler provided the land use aggregations, and Molly Davis with Region 4 of the U.S. Environmental Protection Agency provided some of the technical analysis.

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TMDL Program

http://www.dep.state.fl.us/water/tmdl/index.htm

Identification of Impaired Surface Waters Rule

http://www.dep.state.fl.us/water/tmdl/docs/AmendedIWR.pdf

STORET Program

http://www.dep.state.fl.us/water/storet/index.htm

2002 305(b) Report

http://www.dep.state.fl.us/water/docs/2002_305b.pdf

Criteria for Surface Water Quality Classifications

http://www.dep.state.fl.us/legal/rules/shared/62-302t.pdf

Basin Status Report for the Tampa Bay Tributaries Basin

http://www.dep.state.fl.us/water/tmdl/stat_rep.htm

Water Quality Assessment Report for the Tampa Bay Tributaries Basin

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Allocation Technical Advisory Committee (ATAC) Report

U.S. Environmental Protection Agency

Region 4: Total Maximum Daily Loads in Florida

http://www.epa.gov/region4/water/tmdl/florida/

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Chapter 1: INTRODUCTION

1.1 Purpose of Report

This report presents the Total Maximum Daily Load (TMDL) for total coliform for Cypress Creek, which is located in the Hillsborough River Planning Unit, within the Tampa Bay Tributaries Basin. The creek was verified as impaired for total coliform, and was included on the Verified List of impaired waters for the Tampa Bay Tributaries Basin that was adopted by Secretarial Order on May 27, 2004. The Hillsborough River Planning Unit is the northernmost of the four planning units in the Tampa Bay Tributaries Basin **(Figure 1.1).** The TMDL establishes the allowable loadings to Cypress Creek that would restore the waterbody so that it meets its applicable water quality criteria for total coliform.

1.2 Identification of Waterbody

Cypress Creek is located in Pasco and Hillsborough Counties, northeast of the city of Tampa. The watershed is rural and has no major cities. It has a 174-square-mile drainage area **(Figure 1.2).** Cypress Creek is a second-order, darkwater stream, and, along its length, it exhibits characteristics associated with riverine aquatic environments. Additional information about the creek's hydrology and geology are available in the Basin Status Report for the Tampa Bay Tributaries Basin (Florida Department of Environmental Protection, June 2002).

For assessment purposes, the Florida Department of Environmental Protection (Department) has divided the Tampa Bay Tributaries Basin into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. This TMDL addresses the following WBID:

WBID 1402, Cypress Creek – for total coliform.

Figure 1.1. Location of Cypress Creek and Major Geopolitical Features in the Tampa Bay Tributaries Basin

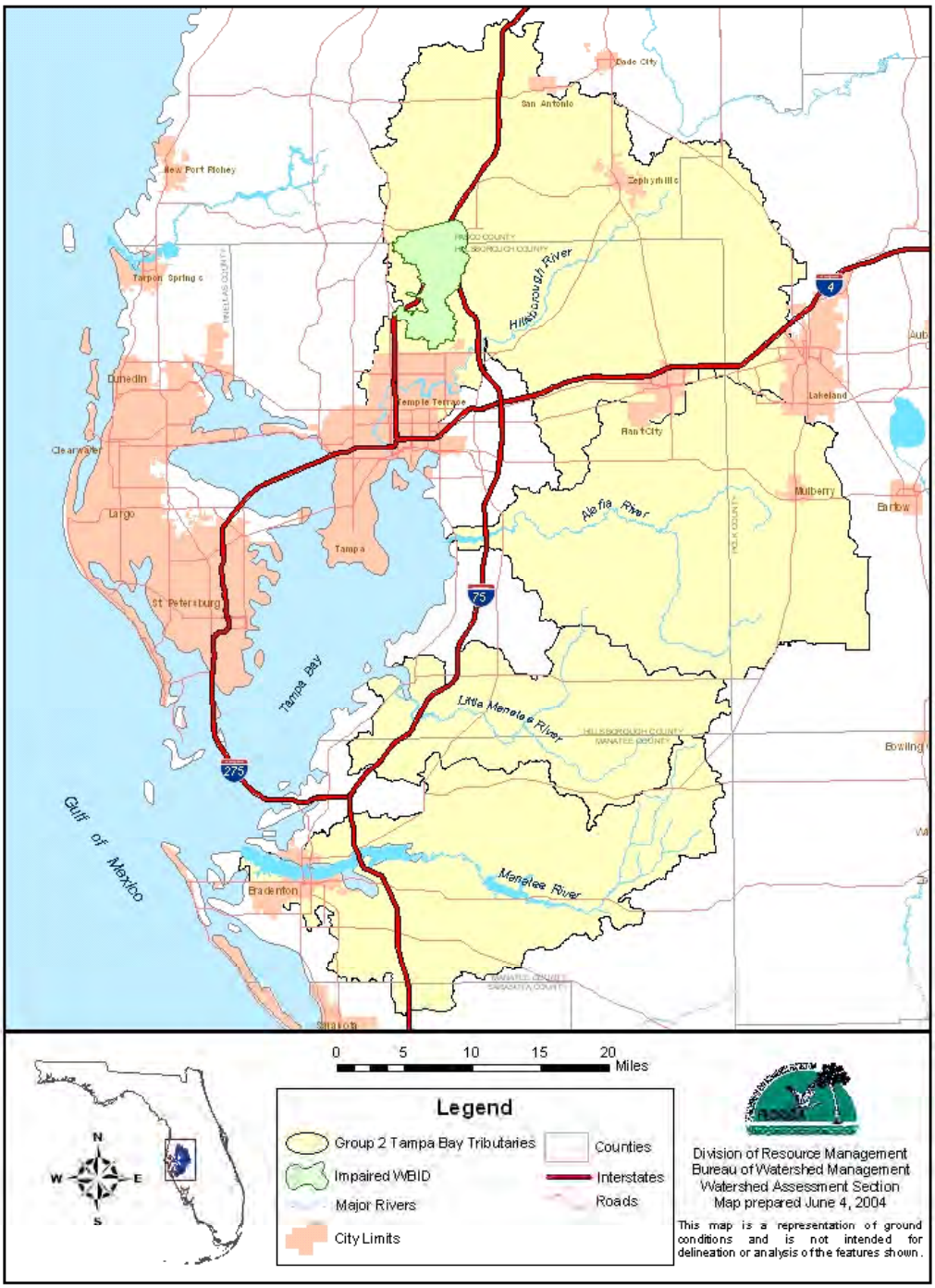
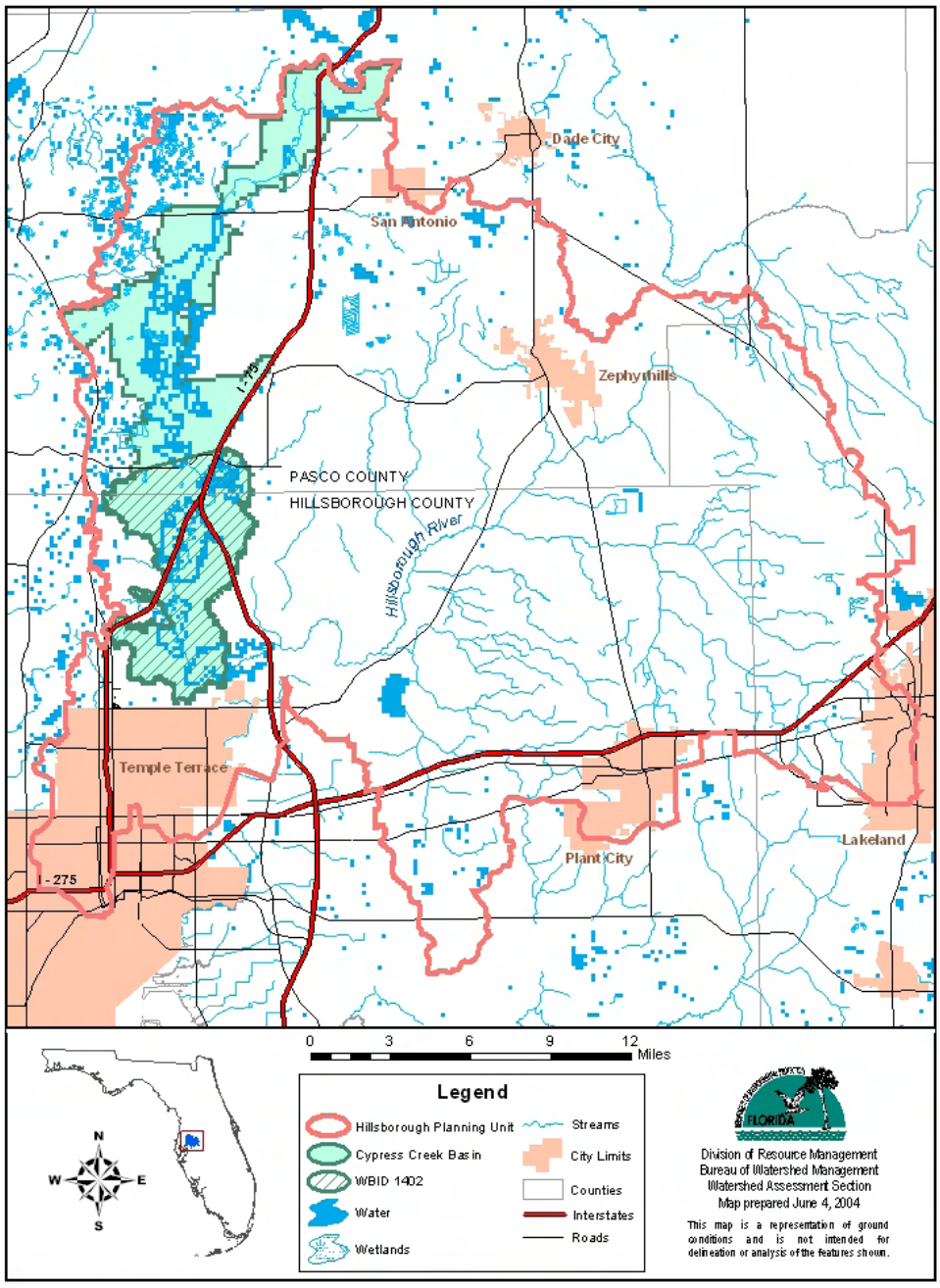


Figure 1.2. Location of Cypress Creek in the Hillsborough River Planning Unit



1.3 Background

This report was developed as part of the Department's watershed management approach for restoring and protecting state waters and addressing TMDL Program requirements. The watershed approach, which is implemented using a cyclical management process that rotates through the state's 52 river basins over a 5-year cycle, provides a framework for implementing the TMDL Program–related requirements of the 1972 federal Clean Water Act and the 1999 Florida Watershed Restoration Act (FWRA, Chapter 99-223, Laws of Florida).

A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and still meet water quality standards, including its applicable water quality criteria and its designated uses. TMDLs are developed for waterbodies that are verified as not meeting their water quality standards. TMDLs provide important water quality restoration goals that will guide restoration activities.

This TMDL Report will be followed by the development and implementation of a Basin Management Action Plan, or BMAP, to reduce the amount of total coliform that caused the verified impairment of Cypress Creek. These activities will depend heavily on the active participation of the Southwest Florida Water Management District (SWFWMD), local governments, businesses, and other stakeholders. The Department will work with these organizations and individuals to undertake or continue reductions in the discharge of pollutants and achieve the established TMDLs for impaired waterbodies.

Chapter 2: DESCRIPTION OF WATER QUALITY PROBLEM

2.1 Statutory Requirements and Rulemaking History

Section 303(d) of the federal Clean Water Act requires states to submit to the U.S. Environmental Protection Agency (EPA) a list of surface waters that do not meet applicable water quality standards (impaired waters) and establish a TMDL for each pollutant causing impairment of the listed waters on a schedule. The Department has developed such lists, commonly referred to as 303(d) lists, since 1992. The list of impaired waters in each basin, referred to as the Verified List, is also required by the FWRA (Subsection 403.067[4], Florida Statutes [F.S.]), and the state's 303(d) list is amended annually to include basin updates.

Florida's 1998 303(d) list included 21 waterbodies in the Hillsborough River Planning Unit. However, the FWRA (Section 403.067, F.S.) stated that all previous Florida 303(d) lists were for planning purposes only and directed the Department to develop, and adopt by rule, a new science-based methodology to identify impaired waters. After a long rule-making process, the Environmental Regulation Commission adopted the new methodology as Chapter 62-303, Florida Administrative Code (F.A.C.) (Identification of Impaired Surface Waters Rule, or IWR), in April 2001.

2.2 Information on Verified Impairment

The Department used the IWR to assess water quality impairments in the Tampa Bay Tributaries Basin and has verified the impairment for total coliform in Cypress Creek. **Table 2.1** summarizes these results for total coliform for the verification period for Cypress Creek.

Table 2.1. Summary of Total Coliform Data for Cypress Creek, WBID 1402, January 1996 – December 2003

Number of Samples	Number of Exceedances	Percent Exceedances	Maximum Exceedance (cfu/100mL*)	Average Exceedance (cfu/100mL*)
69	18	26%	10,700	6,261

* Colony forming units per 100 milliliters.

Chapter 3. DESCRIPTION OF APPLICABLE WATER QUALITY STANDARDS AND TARGETS

3.1 Classification of the Waterbody and Criteria Applicable to the TMDL

Florida's surface waters are protected for five designated use classifications, as follows:

Class I	**Potable water supplies**
Class II	**Shellfish propagation or harvesting**
Class III	**Recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife**
Class IV	**Agricultural water supplies**
Class V	**Navigation, utility, and industrial use (there are no state waters currently in this class)**

Cypress Creek is a Class III waterbody, with a designated use of recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife. The Class III criterion applicable to this TMDL is the total coliform criterion.

3.2 Applicable Water Quality Standards and Numeric Water Quality Target

3.2.1 Total Coliform Criterion

Numeric criteria for bacterial quality are expressed in terms of bacteria concentrations. The water quality criterion for protection of Class III waters, as established by Chapter 62-302, F.A.C., states the following:

> ***Total Coliform Bacteria:***
> *The most probable number (MPN) per 100 mL shall be less than or equal to 1,000 as a monthly average nor exceed 1,000 in more than 20 percent of the samples examined during any month; and less than or equal to 2,400 at any time.*

The criterion states that monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30-day period. During the development of load curves for the impaired stream (as described in subsequent chapters), there were insufficient data (fewer than 10 samples in a given month) available to evaluate the geometric mean criterion for total coliform bacteria. Therefore, the criterion selected for the TMDL was not to exceed 2,400 cfu/100mL.

[1] Most probable number.

Chapter 4: ASSESSMENT OF SOURCES

4.1 Types of Sources

An important part of the TMDL analysis is the identification of pollutant source categories, source subcategories, or individual sources of the pollutant of concern in the watershed, and the amount of pollutant loading contributed by each of these sources. Sources are broadly classified as either "point sources" or "nonpoint sources." Historically, the term point sources has meant discharges to surface waters that typically have a continuous flow via a discernable, confined, and discrete conveyance, such as a pipe. Domestic and industrial wastewater treatment facilities (WWTFs) are examples of traditional point sources. In contrast, the term "nonpoint sources" was used to describe intermittent, rainfall driven, diffuse sources of pollution associated with everyday human activities, including runoff from urban land uses, agriculture, silviculture, and mining; discharges from failing septic systems; and atmospheric deposition.

However, the 1987 amendments to the Clean Water Act redefined certain nonpoint sources of pollution as point sources subject to regulation under the EPA's National Pollutant Discharge Elimination (NPDES) Program. These nonpoint sources included certain urban stormwater discharges, including those from local government master drainage systems, construction sites over five acres, and a wide variety of industries (see **Appendix A** for background information on the federal and state stormwater programs).

To be consistent with Clean Water Act definitions, the term "point source" will be used to describe traditional point sources (such as domestic and industrial wastewater discharges) and stormwater systems requiring an NPDES stormwater permit when allocating pollutant load reductions required by a TMDL (see **Section 6.1**). However, the methodologies used to estimate nonpoint source loads do not distinguish between NPDES stormwater discharges and non-NPDES stormwater discharges, and as such, this source assessment section does not make any distinction between the two types of stormwater.

4.2 Potential Sources of Total Coliform in the Cypress Creek Watershed

4.2.1 Point Sources

There are no permitted wastewater treatment facilities that discharge total coliform loads either directly or indirectly into Cypress Creek.

Municipal Separate Storm Sewer System Permittees

Within the Cypress Creek watershed, the stormwater collection systems owned and operated by Hillsborough County and Pasco County are covered by an NPDES municipal separate storm sewer system (MS4) Phase I permit. Hillsborough County is covered under Permit Number FLS000006, and Pasco County is covered under Permit Number FLS000032.

4.2.2 Land Uses and Nonpoint Sources

Additional total coliform loadings to Cypress Creek are generated from nonpoint sources in the watershed. These potential sources include loadings from surface runoff, wildlife, livestock, pets, and leaking septic tanks.

Wildlife

Wildlife deposit feces containing coliform bacteria onto land surfaces, where the bacteria can be transported during storm events to nearby streams. Some wildlife (such as otters, beavers, raccoons, and birds) deposit their feces directly into the water. The bacterial load from naturally occurring wildlife is assumed to represent background conditions. In addition, any strategy employed to control this source would probably have a negligible impact on achieving water quality standards.

Agricultural Animals

Agricultural animals are the source of several types of coliform loading to streams. Agricultural activities, including runoff from pastureland and cattle in streams, have the potential to impact water quality. Livestock data for Pasco and Hillsborough County, from the 1997 *Agricultural Census Report,* are listed in **Table 4.1** (U.S. Department of Agriculture, 1997).

Table 4.1. Livestock Distribution in Pasco and Hillsborough Counties in 1997

Livestock Distribution	Pasco County	Hillsborough County
Cattle/Calves	41,448	62,328
Milk cows	5,150	4,463
Hogs/Pigs	3,620	3,567
Poultry layers >13 weeks	(D)	1,409,342
Poultry broilers	(D)	(D)
Sheep/Lambs	72	285
Horses	1,116	2,754

Notes: (D) – Data withheld to avoid disclosing data for individual farms.

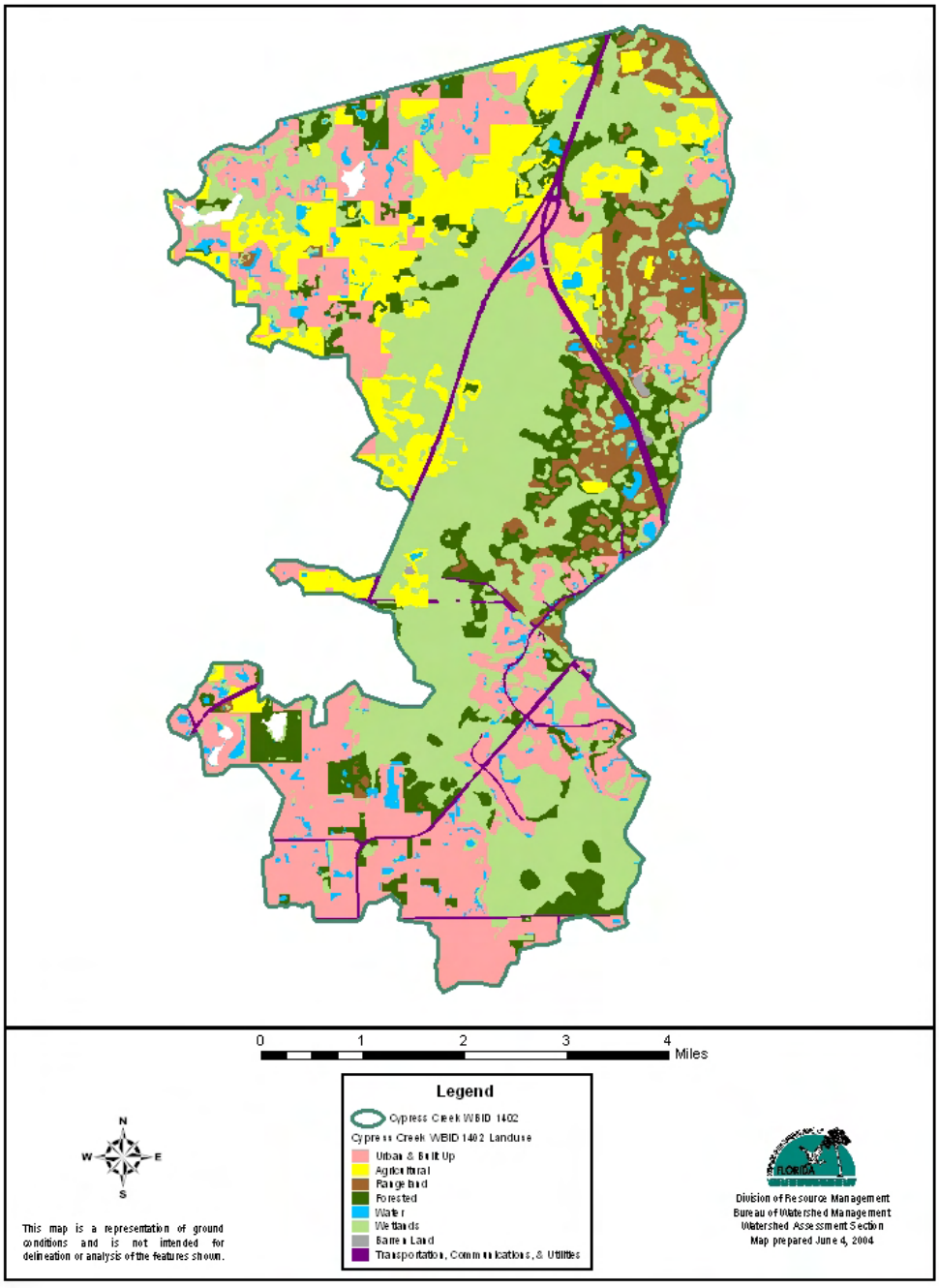
Land Uses

The spatial distribution and acreage of different land use categories were identified using the 1999 land use coverage (scale 1:40,000) contained in the Department's geographic information system (GIS) library. Land use categories in the watershed were aggregated using the simplified Level 1 codes. **Table 4.2** shows the acreage of the different land use categories in WBID 1402. Wetlands and water make up 42 percent of the watershed. Residential is the second largest land use category at 17 percent, followed by agriculture at 12 percent. **Figure 4.1** shows the distribution of the principal land uses in the WBID.

Table 4.2. Classification of Land Use Categories in the Cypress Creek Watershed, WBID 1402

Level 1 Code	Land Use Category	Acreage
1000	Urban and Built-Up	5,076.65
2000	Agriculture	2,467.21
3000	Rangeland	1,349.74
4000	Upland Forest	2,087.20
5000	Water	550.90
6000	Wetlands	7,812.78
7000	Barren Land	24.15
8000	Transportation, Communication, and Utilities	578.45

Figure 4.1. Principal Land Uses in the Cypress Creek Watershed, WBID 1402



Population

According to the U.S Census Bureau, the total population for Hillsborough County, which includes most of (but is not exclusive to) WBID 1402, was 998,948, with 425,962 housing units. The Bureau reported the population density in the year 2000 was at or less than 950.6 people per square mile (10 persons/square mile is the minimum used by the Census Bureau), with a housing density of 405.3 houses per square mile. For Pasco County, which includes some of WBID 1402, the total population for 2000 was 344,765, with 173,717 housing units. The population density in the year 2000 was at or less than 462.9 people per square mile, with a housing density of 233.2 houses per square mile. Since the Cypress Creek watershed is located in the rural part of these counties, the population density is lower in the watershed.

Septic Tanks

The Florida Department of Health (FDOH) reports that, as of fiscal year 2001, there were 100,483 registered septic tanks in Hillsborough County and 66,583 septic tanks in Pasco County (Florida Department of Health Web site, 2004). These totals are based on new septic tank construction and do not reflect systems removed from service. The number of residences using septic tanks in Hillsborough and Pasco Counties is as follows:

- Hillsborough County has 425,962 households (U.S. Census Bureau), which means that approximately 76 percent of the residences are connected to wastewater treatment plants and 24 percent utilize septic tanks.
- Pasco County has 173,717 households, which means that approximately 62 percent of the residences are connected to wastewater treatment plants and 38 percent utilize septic tanks.

While the percentage of residences connected to wastewater treatment plants in the Cypress Creek watershed cannot be determined by these countywide statistics, it is assumed that the percentage of residences connected is closer to the percentage for Pasco County (38 percent), given the watershed's rural nature.

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Determination of Loading Capacity

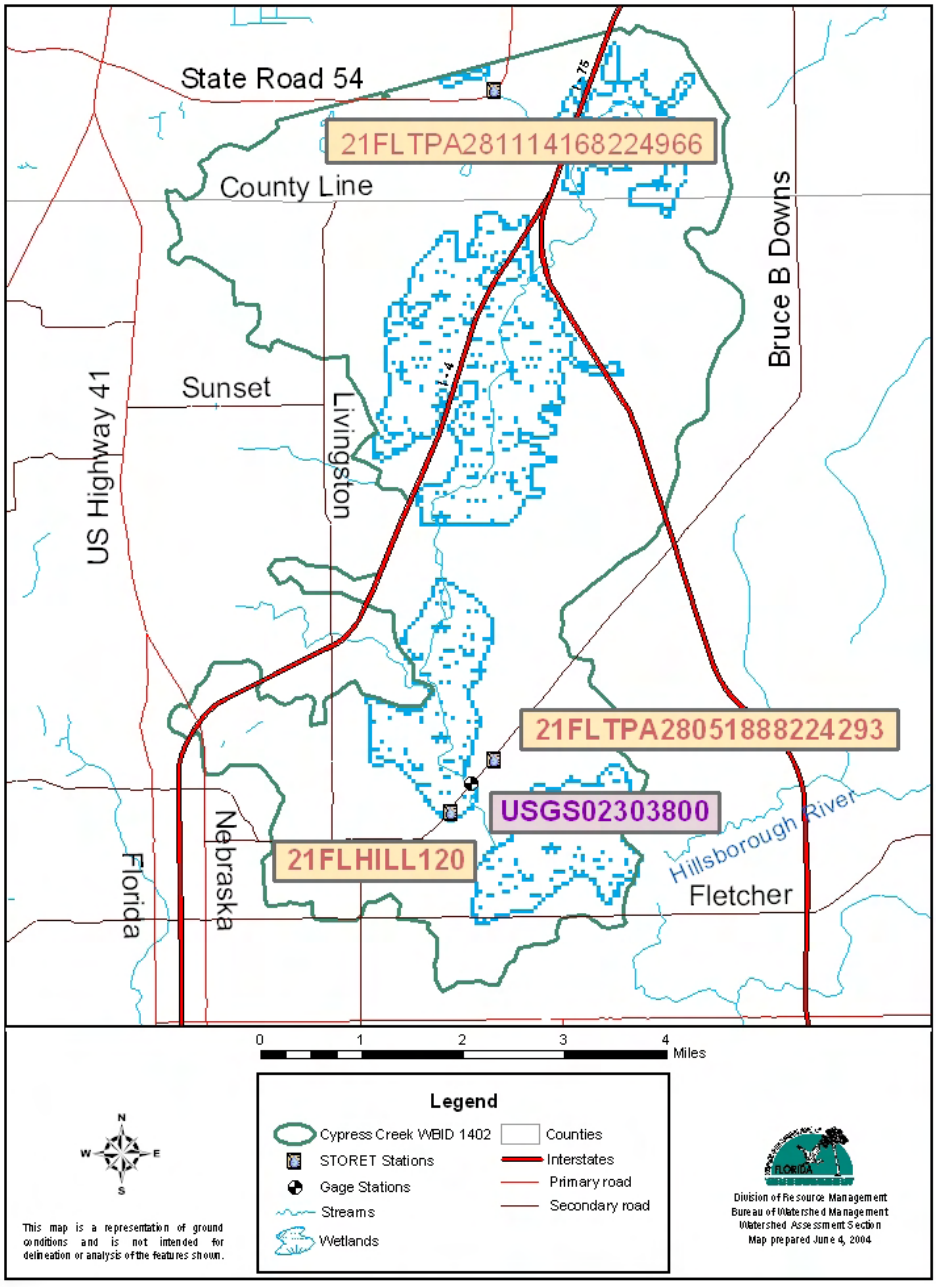
The methodology used for this TMDL is the "load duration curve." Also known as the "Kansas Approach" because it was developed by the state of Kansas, this method has been well documented in the literature, with improved modifications used by EPA Region 4. Basically, the method relates the pollutant concentration to the flow of the stream in order to establish the existing loading capacity and the allowable pollutant load (TMDL) under a spectrum of flow conditions. It then determines the maximum allowable pollutant load and load reduction requirement based on the analysis of the critical flow conditions. Using this method, it takes four steps to develop the TMDL and establish the required load reduction:

1. Develop the flow duration curve,
2. Develop the load duration curve for both the allowable load and existing loading,
3. Define the critical conditions, and
4. Establish the needed load reduction by comparing the existing loading with the allowable load under critical conditions.

5.1.1 Data Used in the Determination of the TMDL

There are three sampling stations in WBID 1402 that have historical observations **(Figure 5.1).** The primary data collector of historical data is the Hillsborough County Environmental Protection Commission, which maintained a routine sampling site, 21FLHILL120 (previously 21FLHILL24030047). The site was sampled monthly from January 1996 through December 2001. Other stations include 21FLTPA 28051888224293 and 21FLTPA 281114168224966, which were sampled by the Department's Southwest District in March and April, 2002. Flow data were obtained from the U.S. Geological Survey (USGS) Gage Station 02303800/Cypress Creek near Sulphur Springs, Florida. **Figure 5.1** shows the locations of these sites. (See **Appendix B** for a statistical overview of the observed historical data at the sites).

Figure 5.1 Historical Monitoring Sites in Cypress Creek, WBID 1402



5.1.2 TMDL Development Process

Based on flow records from USGS Gage 02303800**,** a flow duration curve was developed **(Figure 5.2).** Using the flows from this curve, a load duration curve for total coliform **(Figure 5.3)** was calculated using the following equation:

(1) (observed flow) x (conversion factor) x (state criteria) = ([total coliform quantity]/day or daily load)

The above equation yields the load duration curve or allowable load curve **(Figure 5.3).** Using **Equation 1** (above), a table was calculated **(Table 5.1)** by substituting the observed data for the state criterion value. Total coliform observations were then plotted, and it was noted where the samples were in relation to the allowable load curve (above or below the curve). Those above the curve **(Figure 5.3)** are noted as exceedances to the state criterion.

Figure 5.2. Flow Duration Curve for USGS Gage 02303800

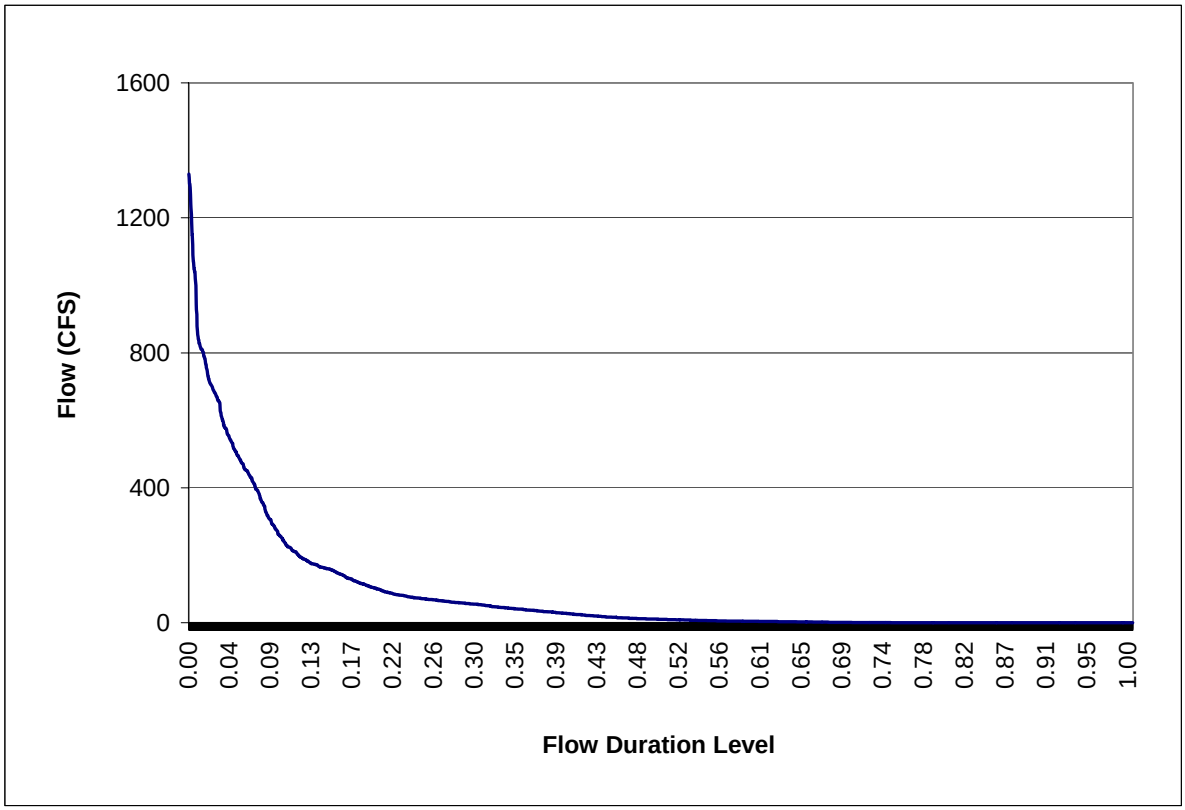
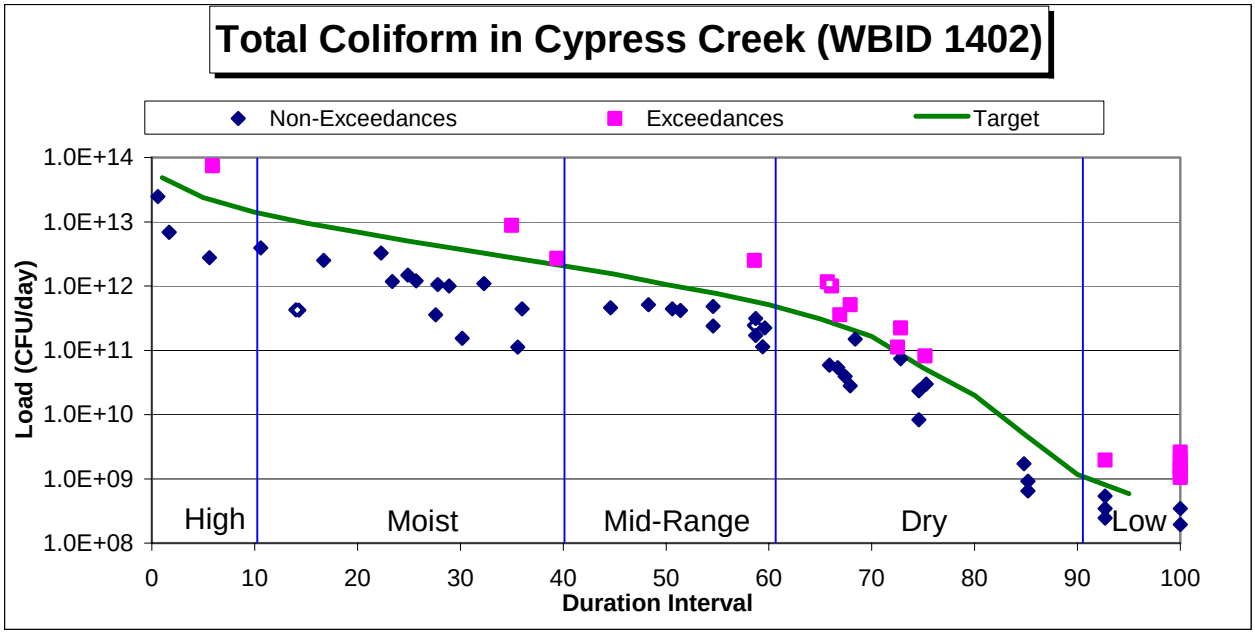


Figure 5.3. Total Coliform Observations and Load Duration Curve in Cypress Creek, WBID 1402



Note: A trend line using an exponential equation did not fit through the data; therefore, the target load is based on the analysis of various flow regimes.

Table 5.1. Observed Data for Calculating Exceedances to the State Criterion for Cypress Creek, WBID 1402, January 23, 1996, through April 9, 2002

WQ Station ID:	***All***
8-Digit Hydrologic Unit Code (HUC):	***03100205***
Drainage Area:	***160 square miles at USGS gage and sampling stations***
Note:	***The analysis includes only samples collected during the Group 2 listing period (January 1996 – December 2003).***

Total Coliform Station	Sample Date	Sample Time	Flow (cfs)	Flow Rank (percent)	Total Coliform (cfu/100mL)	Total Coliform Load (cfu/day)
21FLHILL24030047	1/23/1996	1120	46.000	35.6%	100	1.13E+11
21FLHILL24030047	2/20/1996	1130	63.000	30.2%	100	1.54E+11
21FLHILL24030047	2/20/1996	1130	63.000	30.2%	100	1.54E+11
21FLHILL24030047	3/19/1996	1120	72.000	27.8%	600	1.06E+12
21FLHILL24030047	4/16/1996	1110	147.000	16.7%	700	2.52E+12
21FLHILL24030047	4/16/1996	1110	147.000	16.7%	700	2.52E+12
21FLHILL24030047	5/14/1996	1135	21.000	48.3%	1,000	5.14E+11
21FLHILL24030047	6/18/1996	1130	18.000	50.6%	1,000	4.40E+11
21FLHILL24030047	7/16/1996	1115	68.000	28.9%	600	9.98E+11
21FLHILL24030047	8/20/1996	1125	3.800	67.9%	**5,500**	5.11E+11
21FLHILL24030047	9/24/1996	1110	9.900	58.7%	1,300	3.15E+11
21FLHILL24030047	10/15/1996	1130	82.000	25.7%	600	1.20E+12
21FLHILL24030047	11/19/1996	1115	0.870	75.3%	1,400	2.98E+10
21FLHILL24030047	12/10/1996	1140	9.300	59.4%	500	1.14E+11
21FLHILL24030047	1/21/1997	1115	3.800	67.9%	300	2.79E+10
21FLHILL24030047	2/18/1997	1115	9.900	58.7%	700	1.70E+11
21FLHILL24030047	3/18/1997	1145	0.010	100.0%	1,400	3.43E+08
21FLHILL24030047	4/15/1997	1105	0.020	92.7%	1,100	5.38E+08
21FLHILL24030047	5/20/1997	1115	1.700	72.5%	**2,700**	1.12E+11
21FLHILL24030047	6/17/1997	1300	0.020	92.7%	500	2.45E+08
21FLHILL24030047	7/22/1997	1255	14.000	54.6%	1,400	4.80E+11
21FLHILL24030047	8/19/1997	1135	87.000	24.9%	700	1.49E+12
21FLHILL24030047	9/16/1997	1110	0.020	92.7%	**4,000**	1.96E+09
21FLHILL24030047	10/14/1997	1135	27.000	44.6%	700	4.62E+11
21FLHILL24030047	11/18/1997	1205	175.000	14.0%	100	4.28E+11
21FLHILL24030047	12/9/1997	1105	172.000	14.3%	100	4.21E+11
21FLHILL24030047	1/20/1998	1050	378.000	5.6%	300	2.77E+12
21FLHILL24030047	2/17/1998	1130	1010.000	0.6%	1,000	2.47E+13
21FLHILL24030047	3/17/1998	1104	698.000	1.7%	400	6.83E+12
21FLHILL24030047	4/21/1998	1158	56.000	32.3%	800	1.10E+12
21FLHILL24030047	5/19/1998	1315	0.020	92.7%	700	3.43E+08
21FLHILL24030047	6/16/1998	1104	0.100	84.8%	700	1.71E+09
21FLHILL24030047	7/21/1998	1055	103.000	22.3%	1,300	3.28E+12
21FLHILL24030047	8/25/1998	1106	73.000	27.6%	200	3.57E+11

Total Coliform Station	Sample Date	Sample Time	Flow (cfs)	Flow Rank (percent)	Total Coliform (cfu/100mL)	Total Coliform Load (cfu/day)
21FLHILL24030047	9/15/1998	1316	230.000	10.6%	700	3.94E+12
21FLHILL24030047	10/20/1998	1058	96.000	23.4%	500	1.17E+12
21FLHILL24030047	11/17/1998	1125	14.000	54.6%	700	2.40E+11
21FLHILL24030047	12/8/1998	1105	4.800	65.9%	500	5.87E+10
21FLHILL120	1/19/1999	1225	10.000	58.6%	1,000	2.45E+11
21FLHILL120	2/16/1999	1232	9.900	58.7%	1,000	2.42E+11
21FLHILL120	3/16/1999	1252	1.600	72.8%	1,900	7.44E+10
21FLHILL120	4/20/1999	1230	0.010	100.0%	100	2.45E+07
21FLHILL120	7/20/1999	1120	9.100	59.6%	1,000	2.23E+11
21FLHILL120	9/22/1999	1306	17.000	51.4%	1,000	4.16E+11
21FLHILL120	10/12/1999	1308	45.000	36.0%	400	4.40E+11
21FLHILL120	11/16/1999	1115	4.000	67.4%	400	3.91E+10
21FLHILL120	12/14/1999	1245	4.400	66.7%	500	5.38E+10
21FLHILL120	1/18/2000	1244	3.600	68.4%	1,700	1.50E+11
21FLHILL120	2/15/2000	1110	4.300	66.9%	**3,400**	3.58E+11
21FLHILL120	3/14/2000	1210	0.010	100.0%	800	1.96E+08
21FLHILL120	5/16/2000	1315	0.010	100.0%	**6,000**	1.47E+09
21FLHILL120	6/20/2000	1305	0.010	100.0%	**10,700**	2.62E+09
21FLHILL120	7/18/2000	1300	0.010	100.0%	**8,100**	1.98E+09
21FLHILL120	8/15/2000	1250	4.700	66.1%	**8,700**	1.00E+12
21FLHILL120	9/19/2000	1300	48.000	35.0%	**7,500**	8.81E+12
21FLHILL120	10/10/2000	1245	4.900	65.7%	**9,700**	1.16E+12
21FLHILL120	11/14/2000	1230	0.010	100.0%	**4,800**	1.17E+09
21FLHILL120	12/12/2000	1130	0.010	100.0%	**4,300**	1.05E+09
21FLHILL120	3/20/2001	1115	0.010	100.0%	**6,300**	1.54E+09
21FLHILL120	8/21/2001	1239	37.000	39.4%	**3,000**	2.72E+12
21FLHILL120	9/18/2001	1243	367.000	5.9%	**8,300**	7.45E+13
21FLHILL120	10/16/2001	1231	10.000	58.6%	**10,200**	2.50E+12
21FLHILL120	11/13/2001	1243	1.600	72.8%	**5,700**	2.23E+11
21FLHILL120	12/11/2001	1252	0.880	75.2%	**3,800**	8.18E+10
21FLTPA 28051888224293	3/26/2002	150	1.000	74.6%	340	8.32E+09
21FLTPA281114168224966	3/26/2002	100	1.000	74.6%	960	2.35E+10
21FLTPA 28051888224293	4/9/2002	430	0.080	85.2%	470	9.20E+08
21FLTPA281114168224966	4/9/2002	940	0.080	85.2%	330	6.46E+08

Values on the load duration curve can generally be grouped by hydrologic conditions to identify the most likely potential sources. The range of flows has been divided into different "flow zones": High, Moist, Mid-Range, Dry, and Low **(Figure 5.3)**. Exceedances falling into the 10th through 40th percentile flows (Moist zone) are typically associated with moist conditions when stormwater loads are the most likely source, and exceedances falling in the 60th through 90th percentiles (Dry zone) are typically associated with dry conditions when point sources are likely the dominant source.

There were 18 exceedances out of the 69 observations in the sampling period. One exceedance occurred in the High flow zone, two in the Moist flow zone, one in the Mid-Range flow zone, seven in the Dry flow zone, and seven in the Low flow zone. This analysis did not use values for the High and Low flow zones because they represent extreme high and low-flow events.

Finally, the percent reduction in loading needed for compliance with the state criterion was calculated **(Table 5.2)**. This calculation involved both the allowable loads and existing loads previously computed. Using percentile increments of 25, 50, and 75, the needed reduction of daily load for each zone was computed using the following formula:

$$(2) \qquad \frac{\text{(existing load) – (allowable load)}}{\text{(existing load) X 100}}$$

The loading capacity (TMDL) and required percent reduction were then calculated as the median of the allowable loads and percent reductions, respectively, needed over the data range of the Moist, Mid-Range, and Dry flow zones **(Table 5.2)**.

Table 5.2. Table for Calculating Needed Reduction of Total Coliform

Flow Ranking (percent)	Existing Load for Total Coliform (cfu/day)	Allowable Load for Total Coliform (cfu/day)	Percent Reduction Required
25	5.76E+12	4.99E+12	13.4
50	2.50E+12	1.06E+12	57.6
75	4.93E+11	5.34E+10	89.2
Median	**2.50E+12**	**1.06E+12**	**57.6**

5.2.3 Critical Conditions/Seasonality

There were no critical conditions, as exceedances were distributed throughout the flow record.

Chapter 6: DETERMINATION OF THE TMDL

6.1 Expression and Allocation of the TMDL

The objective of a TMDL is to provide a basis for allocating acceptable loads among all of the known pollutant sources in a watershed so that appropriate control measures can be implemented and water quality standards achieved. A TMDL is expressed as the sum of all point source loads (Waste Load Allocations, or WLAs), nonpoint source loads (Load Allocations, or LAs), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

$$\mathbf{TMDL = \sum WLAs + \sum LAs + MOS}$$

As discussed earlier, the WLA is broken out into separate subcategories for wastewater discharges and stormwater discharges regulated under the NPDES Program:

$$\mathbf{TMDL \cong \sum WLAs_{wastewater} + \sum WLAs_{NPDES\ Stormwater} + \sum LAs + MOS}$$

It should be noted that the various components of the revised TMDL equation may not sum up to the value of the TMDL because (a) the WLA for NPDES stormwater is typically based on the percent reduction needed for nonpoint sources and is also accounted for within the LA, and (b) TMDL components can be expressed in different terms (for example, the WLA for stormwater is typically expressed as a percent reduction, and the WLA for wastewater is typically expressed as mass per day).

WLAs for stormwater discharges are typically expressed as "percent reduction" because it is very difficult to quantify the loads from MS4s (given the numerous discharge points) and to distinguish loads from MS4s from other nonpoint sources (given the nature of stormwater transport). The permitting of stormwater discharges also differs from the permitting of most wastewater point sources. Because stormwater discharges cannot be centrally collected, monitored, and treated, they are not subject to the same types of effluent limitations as wastewater facilities, and instead are required to meet a performance standard of providing treatment to the "maximum extent practical" through the implementation of best management practices (BMPs).

This approach is consistent with federal regulations (40 CFR § 130.2[I]), which state that TMDLs can be expressed in terms of mass per time (e.g., pounds per day), toxicity, or **other appropriate measure**. The TMDL for Cypress Creek is expressed in terms of cfu/day and percent reduction, and represents the maximum daily total coliform load the creek can assimilate and maintain the total coliform criterion. **Table 6.1** lists the TMDL components for Cypress Creek.

Table 6.1. TMDL Components for Cypress Creek, WBID 1402

Parameter	TMDL (cfu/day)	WLA		LA (percent reduction)	MOS
		Wastewater (cfu/day)	NPDES Stormwater (percent)		
Total Coliform	1.06E+12	NA	57.6%	57.6%	Implicit

NA – not applicable.

6.2 Load Allocation

Based on a loading duration curve approach similar to that developed by Kansas (Stiles, 2002), a total coliform reduction of 57.6 percent is needed from nonpoint sources. It should be noted that the load allocation (LA) includes loading from stormwater discharges regulated by the Department and the SWFWMD that are not part of the NPDES Program (see **Appendix A**).

6.3 Wasteload Allocation

6.3.1 NPDES Wastewater Discharges

None.

6.3.2 NPDES Stormwater Discharges

The wasteload allocation (WLA) for stormwater discharges is a 57.6 percent reduction in total coliform loading, which is the same percent reduction required for nonpoint sources. It should be noted that any MS4 permittee will only be responsible for reducing the loads associated with stormwater outfalls that it owns or otherwise has responsible control over, and it is not responsible for reducing other nonpoint source loads in its jurisdiction.

6.4 Margin of Safety

Consistent with the recommendations of the Allocation Technical Advisory Committee (Florida Department of Environmental Protection, February 2001), an implicit margin of safety (MOS) was used in the development of this TMDL. An implicit MOS was included in the TMDL by not allowing any exceedances of the state criterion, even though intermittent natural exceedances of the criterion would be expected and would be taken into account when determining impairment. An implicit MOS is appropriate as existing loads are based on instream coliform measurements. These measurements include decay processes occurring in the creek and do not represent the maximum load that can be applied to the land and transported to the stream during a rain event.

Chapter 7: NEXT STEPS: IMPLEMENTATION PLAN DEVELOPMENT AND BEYOND

7.1 Basin Management Action Plan

Following the adoption of this TMDL by rule, the next step in the TMDL process is to develop an implementation plan for the TMDL, which will be a component of the Basin Management Action Plan (BMAP) for the Tampa Bay Tributaries Basin. This document will be developed over the next year in cooperation with local stakeholders and will attempt to reach consensus on more detailed allocations and on how load reductions will be accomplished. The BMAP will include the following:

- Appropriate allocations among the affected parties,
- A description of the load reduction activities to be undertaken,
- Timetables for project implementation and completion,
- Funding mechanisms that may be utilized,
- Any applicable signed agreement,
- Local ordinances defining actions to be taken or prohibited,
- Local water quality standards, permits, or load limitation agreements, and
- Monitoring and follow-up measures.

References

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Appendices

Appendix A: Background Information on Federal and State Stormwater Programs

In 1982, Florida became the first state in the country to implement statewide regulations to address the issue of nonpoint source pollution by requiring new development and redevelopment to treat stormwater before it is discharged. The Stormwater Rule, as authorized in Chapter 403, F.S., was established as a technology-based program that relies on the implementation of BMPs that are designed to achieve a specific level of treatment (i.e., performance standards) as set forth in Chapter 62-40, F.A.C.

The rule requires the state's water management districts (WMDs) to establish stormwater pollutant load reduction goals (PLRGs) and adopt them as part of a Surface Water Improvement and Management (SWIM) plan, other watershed plan, or rule. Stormwater PLRGs are a major component of the load allocation part of a TMDL. To date, stormwater PLRGs have been established for Tampa Bay, Lake Thonotosassa, the Winter Haven Chain of Lakes, the Everglades, Lake Okeechobee, and Lake Apopka. No PLRG had been developed for Newnans Lake at the time this TMDL report was developed.

In 1987, the U.S. Congress established Section 402(p) as part of the federal Clean Water Act Reauthorization. This section of the law amended the scope of the federal NPDES stormwater permitting program to designate certain stormwater discharges as "point sources" of pollution. These stormwater discharges include certain discharges that are associated with industrial activities designated by specific standard industrial classification (SIC) codes, construction sites disturbing 5 or more acres of land, and master drainage systems of local governments with a population above 100,000, which are better known as municipal separate storm sewer systems (MS4s). However, because the master drainage systems of most local governments in Florida are interconnected, the EPA has implemented Phase I of the MS4 permitting program on a countywide basis, which brings in all cities (incorporated areas), Chapter 298 urban water control districts, and the Florida Department of Transportation throughout the 15 counties meeting the population criteria.

An important difference between the federal and state stormwater permitting programs is that the federal program covers both new and existing discharges, while the state program focuses on new discharges. Additionally, Phase II of the NPDES Program will expand the need for these permits to construction sites between 1 and 5 acres, and to local governments with as few as 10,000 people. These revised rules require that these additional activities obtain permits by 2003. While these urban stormwater discharges are now technically referred to as "point sources" for the purpose of regulation, they are still diffuse sources of pollution that cannot be easily collected and treated by a central treatment facility, as are other point sources of pollution, such as domestic and industrial wastewater discharges. The Department recently accepted delegation from the EPA for the stormwater part of the NPDES Program. It should be noted that most MS4 permits issued in Florida include a reopener clause that allows permit revisions to implement TMDLs once they are formally adopted by rule.

Appendix B: Statistical Table of Observed Historical Data for Total Coliform, Cypress Creek, WBID 1402, January 19, 1999 – April 9, 2002

Date	Station	Time	Depth (feet)	Result (cfu/day)	Remark Code*
1/19/1999	21FLHILL120	1225	2.3	1,000	
2/16/1999	21FLHILL120	1232	2.5	1,000	
3/16/1999	21FLHILL120	1252	2.3	1,900	
4/20/1999	21FLHILL120	1230	1.5	100	
7/20/1999	21FLHILL120	1120	2.3	1,000	
9/22/1999	21FLHILL120	1306	2	1,000	
10/12/1999	21FLHILL120	1308	3	400	
11/16/1999	21FLHILL120	1115	1.8	400	
12/14/1999	21FLHILL120	1245	2.1	500	
1/18/2000	21FLHILL120	1244	1.5	1,700	
2/15/2000	21FLHILL120	1110	2	3,400	
3/14/2000	21FLHILL120	1210	1.5	800	
5/16/2000	21FLHILL120	1315	1	6,000	
6/20/2000	21FLHILL120	1305	1	10,700	
7/18/2000	21FLHILL120	1300	1.5	8,100	
8/15/2000	21FLHILL120	1250	2	8,700	
9/19/2000	21FLHILL120	1300	3	7,500	
10/10/2000	21FLHILL120	1245	.	9,700	
11/14/2000	21FLHILL120	1230	.	4,800	
12/12/2000	21FLHILL120	1130	.	4,300	
3/20/2001	21FLHILL120	1115	.	6,300	
8/21/2001	21FLHILL120	1239	.	3,000	
9/18/2001	21FLHILL120	1243	.	8,300	
10/16/2001	21FLHILL120	1231	.	10,200	
11/13/2001	21FLHILL120	1243	.	5,700	
12/11/2001	21FLHILL120	1252	.	3,800	
1/22/1991	21FLHILL24030047	1050	1	700	
2/25/1991	21FLHILL24030047	1110	1	300	
3/26/1991	21FLHILL24030047	1055	1	800	
4/23/1991	21FLHILL24030047	1059	1	300	J
5/21/1991	21FLHILL24030047	1050	1	2,100	
6/25/1991	21FLHILL24030047	1130	1	1,800	
7/30/1991	21FLHILL24030047	1048	1	1,000	
8/27/1991	21FLHILL24030047	1130	1	500	
9/24/1991	21FLHILL24030047	1045	1	1,100	

Date	Station	Time	Depth (feet)	Result (cfu/day)	Remark Code*
10/22/1991	21FLHILL24030047	1119	1	700	
11/19/1991	21FLHILL24030047	1045	1	11,900	L
2/25/1992	21FLHILL24030047	1140	1.5	1,600	
3/24/1992	21FLHILL24030047	1055	1	300	J
4/21/1992	21FLHILL24030047	1055	1	20,000	L
7/28/1992	21FLHILL24030047	1107	0.3	1,000	
7/28/1992	21FLHILL24030047	1107	0.25	1,000	
8/25/1992	21FLHILL24030047	1045	1.5	1,700	
9/22/1992	21FLHILL24030047	1055	1.5	500	
10/27/1992	21FLHILL24030047	1106	1.25	700	
10/27/1992	21FLHILL24030047	1106	1.3	700	
11/17/1992	21FLHILL24030047	1110	1.75	300	
11/17/1992	21FLHILL24030047	1110	1.8	300	
12/15/1992	21FLHILL24030047	1125	2	100	
1/19/1993	21FLHILL24030047	1125	2.5	500	
2/16/1993	21FLHILL24030047	1140	1	600	
3/16/1993	21FLHILL24030047	1130	1	500	
4/20/1993	21FLHILL24030047	1035	1	100	
5/18/1993	21FLHILL24030047	1120	1	500	
6/15/1993	21FLHILL24030047	1126	1	400	
7/20/1993	21FLHILL24030047	1115	1.25	260	
7/20/1993	21FLHILL24030047	1115	1.3	260	
8/17/1993	21FLHILL24030047	1125	1.25	760	
8/17/1993	21FLHILL24030047	1125	1	760	
9/14/1993	21FLHILL24030047	1209	1	1,520	
9/14/1993	21FLHILL24030047	1209	1.5	1,520	
10/19/1993	21FLHILL24030047	1140	1	4,000	L
11/16/1993	21FLHILL24030047	1125	1	1,000	
12/14/1993	21FLHILL24030047	1115	1	200	
1/25/1994	21FLHILL24030047	1110	1	400	
2/22/1994	21FLHILL24030047	1132	1	1,200	
3/22/1994	21FLHILL24030047	1115	1	700	
4/26/1994	21FLHILL24030047	1122	1	600	
7/26/1994	21FLHILL24030047	1120	1	4,200	
8/23/1994	21FLHILL24030047	1150	1	1,100	
9/27/1994	21FLHILL24030047	1200	1	1,800	
10/25/1994	21FLHILL24030047	1210	1	200	
11/29/1994	21FLHILL24030047	1125	1	400	
12/13/1994	21FLHILL24030047	1120	1	400	

Date	Station	Time	Depth (feet)	Result (cfu/day)	Remark Code*
1/24/1995	21FLHILL24030047	1130	1	400	
2/21/1995	21FLHILL24030047	1155	1	300	
3/21/1995	21FLHILL24030047	1130	1	500	
4/25/1995	21FLHILL24030047	1135	0.25	1,600	
4/25/1995	21FLHILL24030047	1135	0.3	1,600	
6/27/1995	21FLHILL24030047	1145	1	1,400	
7/25/1995	21FLHILL24030047	1050	1	1,800	
8/22/1995	21FLHILL24030047	1125	1	400	
9/26/1995	21FLHILL24030047	1158	1	300	
10/24/1995	21FLHILL24030047	1135	3.5	500	
11/28/1995	21FLHILL24030047	1210	2	400	
12/12/1995	21FLHILL24030047	1133	2	300	
1/23/1996	21FLHILL24030047	1120	2.5	100	
2/20/1996	21FLHILL24030047	1130	2.8	100	
2/20/1996	21FLHILL24030047	1130	2.75	100	
3/19/1996	21FLHILL24030047	1120	2.5	600	
4/16/1996	21FLHILL24030047	1110	2.75	700	
4/16/1996	21FLHILL24030047	1110	2.8	700	
5/14/1996	21FLHILL24030047	1135	2	1,000	
6/18/1996	21FLHILL24030047	1130	2.5	1,000	
7/16/1996	21FLHILL24030047	1115	2.5	600	
8/20/1996	21FLHILL24030047	1125	1.5	5,500	
9/24/1996	21FLHILL24030047	1110	0.8	1,300	
10/15/1996	21FLHILL24030047	1130	2.8	600	
11/19/1996	21FLHILL24030047	1115	1.5	1,400	
12/10/1996	21FLHILL24030047	1140	2	500	
1/21/1997	21FLHILL24030047	1115	1.5	300	
2/18/1997	21FLHILL24030047	1115	2	700	
3/18/1997	21FLHILL24030047	1145	1.3	1,400	
4/15/1997	21FLHILL24030047	1105	1.3	1,100	
5/20/1997	21FLHILL24030047	1115	1.8	2,700	
6/17/1997	21FLHILL24030047	1300	1.3	500	
7/22/1997	21FLHILL24030047	1255	2	1,400	
8/19/1997	21FLHILL24030047	1135	3	700	
9/16/1997	21FLHILL24030047	1110	1	4,000	L
10/14/1997	21FLHILL24030047	1135	2.5	700	
11/18/1997	21FLHILL24030047	1205	3	100	
12/9/1997	21FLHILL24030047	1105	3	100	K
1/20/1998	21FLHILL24030047	1050	3.5	300	

Date	Station	Time	Depth (feet)	Result (cfu/day)	Remark Code*
2/17/1998	21FLHILL24030047	1130	3.8	1,000	
3/17/1998	21FLHILL24030047	1104	4	400	
4/21/1998	21FLHILL24030047	1158	3	800	
5/19/1998	21FLHILL24030047	1315	1.5	700	
6/16/1998	21FLHILL24030047	1104	1.3	700	
7/21/1998	21FLHILL24030047	1055	3.3	1,300	
8/25/1998	21FLHILL24030047	1106	3	200	
9/15/1998	21FLHILL24030047	1316	3.5	700	
10/20/1998	21FLHILL24030047	1058	3.3	500	
11/17/1998	21FLHILL24030047	1125	3	700	
12/8/1998	21FLHILL24030047	1105	2	500	
3/26/2002	21FLTPA 28051888224293	150	0.25	340	
4/9/2002	21FLTPA 28051888224293	430	0.15	470	
3/26/2002	21FLTPA 281114168224966	100	0.25	960	
4/9/2002	21FLTPA 281114168224966	940	0.4	330	

* J - Estimated value.
K - Actual value is known to be less than value given.
L – Actual value is known to be greater than value given.